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ABSTRACT

The author summarizes the results of 133 studies designed to test approaches to teaching children to think creatively. While acknowledging criticisms that most of the studies use performances on tests of creative thinking and other creative school performances as criteria, he contends that the evidence which they provide can be extremely useful to educators. The most frequently reported types of experiments emphasize: (1) teacher-classroom variables; (2) compiles programs involving packages of materials; and (3) modifications of the Osborne-Parnes training program in creative problem solving. The most successful approaches, based on the author's review, are: (1) those that emphasize the Osborne-Parnes program; (2) other disciplined approaches; (3) the creative arts; and (4) media-oriented programs. The author concludes that, indeed, successful approaches do exist which make it possible to teach children to think creatively. An extensive bibliography is included. (TL)

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This will be rewritten before actual presentation but this is the best I can do at the moments.
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CAN WE TEACH CHILDREN TO THINK CREATIVELY?

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It was with much reluctance that I agreed to participate in this symposium on teaching children to think creatively. I know that it is possible to teach children to think creatively and that it can be done in a variety of ways. I have done it. I have seen my wife do it. I have seen other excellent teachers do it. I have seen children who demonstrated a disability for thinking creatively learn to think creatively. I have seen them continuing for years thereafter to think creatively. I have seen, heard and otherwide experienced their creative products -- their works of art, inventions, innovations, musical compositions, poems, stories, and dramas. I have seen them solving problems creatively, creating new businesses and organizations, inventing new ways of teaching, and generally living creatively. Many of the children, now adults, say it happened. Their parents have told me that it happened. I know that these things would not have happened by chance because I have also seen it not happening to multitudes of their peers.

I hesitated to prepare this paper, not because I knew that it would cost a great deal of time, energy, and money all of which needs to be spent in other ways, but because I know that it will be used to make me appear incompetent. I know in advance the words of ridicule that certain critics will utter. Much that has gone into my knowing that children can be taught to think creatively cannot be documented. Though my evidence satisfies me, I know of no evidence that anyone could present in response to the question posed by this symposium that would be widely acceptable. A fundamental difficulty is that creative thinking can be manifested in an almost infinite number of ways and there is no acceptable way of quantifying all of these different kinds of achievement.

I know in advance that many critics will say that the 133 studies I shall try to summarize are worthless and tell us nothing. However, they have not invented satisfactory methods of investigation. They do not have to remind me that being able to think creatively is not the same thing as thinking creatively. I know this. They do not have to tell me that a score

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Paper prepared for presentation at annual meetings of the American Educational Research Association, Chicago, April 5, 1972.

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on a valid test of creative thinking ability is not the same thing as thinking creatively. I know this. Nevertheless, these are kinds of evidence that can be accumulated and have been accumulating during the past fifteen years. Furthermore, these kinds of evidence are consonant with observations of what happens outside the schools and experimental situations. I am personally impressed by the 12-year follow-up in my long-range predictive validity study of the Torrance Tests of Creative Thinking Ability (1966, 1971, 1972). Many of our validity coefficients are in the .40's, .50's, and .60's. In other words, there is a definite tendency for those who scored high on the tests of creative thinking taken in 1959 to report impressive creative achievements twelve years later in 1971. This is in spite of the fact that many of the subjects report that they did not experience a creative awakening until after their high school years.

I know that even these long-range data will be disparaged because they are largely self report data. Some of these data can be verified because I have relied for one of my indexes largely on publicly recognized and acknowledged creative achievements. The subjects were quick to recognize the shallowness of this procedure, however, and many of them told me in no uncertain words that this is a narrow conception of creative thinking. I anticipated this and had asked them to describe what they considered their three highest or peak creative achievements and to describe their aspirations.

In my own work I have defined creative thinking as a natural human process motivated by strong human needs. Critics of efforts to teach children to think creatively have been quick to point out that if my definition is valid there is no need to teach the process. Skills are involved, however, and skills have to be practiced in order to be developed. I realize that there is ever present in all of our experiments the question of just how much and what we are teaching and how much of the differences found in the teaching experiments are due to the facilitating conditions.

I decided to accept the risks of participating in this symposium, because I believe educational researchers should make known their position on important educational questions such as this one. After all, I have a large stake in this issue. I have devoted a great deal of my life since 1958 in studying the problem, in teaching children to think creatively, in teaching others to do such teaching, and in inventing and developing instructional materials for this purpose.

Procedure

In preparing this paper I have been able to examine 133 studies involving quantification and presentation of evidence plus a still larger number of descriptive reports. I have not considered studies with college students and adults. The tables summarize the nature and degree of success of the 133 experimental studies. The bibliography includes these as well

as some of the most important of the descriptive accounts. In most cases I have had access to the documentary reports. In some cases, however, I have had to rely upon journal articles and abstracts and some of these lacked information necessary for analysis. I am familiar with a number of studies for which I have been unable to obtain reports and these have not been included. My survey is far from complete but in my opinion the evidence from the 133 studies summarized in the tables cannot be discounted completely.

Ways of Teaching Children to Think Creatively

To help organize the data from the 133 studies I have examined I have classified them into the following categories of ways of teaching children to think creatively:

1. Training programs emphasizing the Osborn-Parnes Creative Problem Solving procedures (Osborn, 1963; Parnes, 1967) or modifications of it.

2. Other disciplined approaches, such as training in general semantics, creative research, and the like.

3. Complex programs involving packages of materials, such as the Purdue Creativity Program; Covington, Crutchfield and Davies' Productive Thinking Program; and the Myers and Torrance ideabooks.

4. The creative arts as vehicles for teaching and practicing creative thinking.

5. Media and reading programs designed to teach and give practice in creative thinking.

6. Curricular and administrative arrangements designed to create favorable conditions for learning and practicing creative thinking.

7. Teacher-classroom variables, indirect and direct control, classroom climate, and the like.

8. Motivation, reward, competition, and the like.

9. Testing conditions designed to facilitate a higher level of creative functioning or more valid and reliable test performance.

The frequency and estimate of success attained in the studies in each of these categories are summarized in Table 1. In judging success, a score

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of 1 was awarded if all of the measured objectives of the experiment were attained. If the experiment had a single objective, such as increasing the degree of originality of thinking, a score of 1 was still assigned. However, if data were presented for fluency, flexibility, originality, and elaboration and the only statistically significant gain over the control group was in originality, a score of .25 was awarded. If 10 of 20 tests of significance reached the .05 level of confidence, a score of .50 was awarded.

It will be noted from Table 1 that the most popular approaches to teaching children to think creatively has been through complex programs involving packages of materials, the manipulation of teacher-classroom variables, and the use of modifications of the Osborn-Parnes Creative Problem Solving training program. Somewhat less popular have been the use of the creative arts as vehicles, motivation techniques, and facilitating testing conditions.

The best batting averages have been compiled by those experiments using the various modifications of the Osborn-Parnes training program and other disciplined approaches -- over 90 percent. Programs involving the creative arts, complex programs involving packages of materials, media and reading programs, motivation, and facilitating testing conditions have also been relatively successful -- around 75 percent. The poorest batting averages have been compiled by studies involving curricular and administrative arrangements and teacher-classroom variables.

Let us look more carefully at the summaries for each of the nine categories.

Osborn-Parnes Modifications

From Table 2 it will be noted that all of the experiments using combinations of techniques based on the Osborn-Parnes training program achieved

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some degree of success. The Hutchinson (1963, 1967) study which produced significant results in only 4 of 10 Guilford variables had multiple objectives and did not concentrate on divergent thinking. The Torrance (1961) study which produced impressive results for the second and third grades but failed to produce significant results in the first grade was quite brief (20 minutes) and was later replicated with first graders with successful results by Cartledge and Krauser (1963) and Cropley and Feuring (1971). Almost any regular practitioner of this approach to teaching children to think creatively could furnish dozens of unpublished studies with results equally as impressive as the ones cited in Table 2.

Other Disciplined Procedures

From Table 3, it will be noted that I have included under "other

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disciplined procedures" a method of teaching reading involving creative dramatics and remediation, programs for training children in creative research, and a program for training in general semantics. It will be noted that all of these projects seem to have been rather successful. Perhaps their success can be attributed to the fact that all of them involved both the cognitive and affective attributes of the subjects and gave practice in creative thinking.

Packages of Materials

The experimental studies involving complex programs with packages of materials, as will be noted in Table 4, have been concentrated upon three

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programs: (1) the Covington, Crutchfield and Davies Productive Thinking Program, (2) the Purdue Creative Thinking Program, and (3) the Myers and Torrance ideabooks. Each of these sets of materials scores fairly well, especially when there is class and teacher involvement in their use. Without this involvement, however, children appear not to learn to think creatively.

Less frequently evaluated are the Wisconsin materials developed by Davis and his associates, the Montessori materials, and the Chicago Inservice Training Kit. Only in the case of the Purdue Creativity Program have separate components and combinations of components been evaluated. The exercises seem to come out best in these evaluations and the presentations of principles of creative thinking, poorest. All three programs seem to have been effective with both the high and low Intelligence Quotient groups.

Creative Arts

The 18 experiments involving one or more of the creative arts as a vehicle for teaching children to think creatively seem to have been rather effective, as will be noted from Table 5.

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These experiments range from programs in which the entire curriculum is built upon the creative arts (as in the Fortson and Torrance-Fortson studies) through those involving the creative arts as an extracurricular activity (as in the

Skipper and Even studies) to those involving such experiences in single courses and those involving special summer or other out-of-school programs. Most of these programs have a distinct out-of-school flavor.

Media and Reading Programs

The experiments involving various types of media and reading programs also score a rather good batting average, as will be noted in Table 6.

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There are a number of reading programs that have built-in creativity components but the Reading 360 Program probably represents the most thoroughgoing attempt in this direction. It is the only such program for which there is even a partial evaluation, insofar as I know. The Imagi/Craft Program is quite similar to the Purdue Creativity Program and might have been included in the same category. Its initial field test was a large one and produced impressive results; thus, its originators have not seen fit to run additional evaluations. Of the ideas represented by the list of experiments listed in Table 6, the Junior Great Books Club, the set of stimuli developed by Baker, and the use of typewriters in elementary school creative writing seem to offer promise. My guess is that in the hands of a skilled teacher who understands creative learning and teaching any one of these devices could be counted upon to produce significant results.

Curricular and Administrative Arrangements

The various curricular and administrative arrangement studies listed in Table 7 do not appear to be tremendously promising. I know that there have been creativity evaluations of other curricular and administrative ar-

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rangements that purport to foster creative development (such as the open classroom, the ungraded school, and the like) but I have been unable to obtain reports of these efforts.

The only really bright spot in this category is Seides' experiment in placing artistically and musically talented slow learners in a talent class and giving them opportunities for talent development. This impresses me as a potentially productive idea and what happened in this experiment seems to be similar to what has happened with older youngsters talented in the arts in the North Carolina School of the Arts (Giannini, 1970).

Teacher-Classroom and Climate Variables

While the number of studies involving teacher-classroom and climate variables is impressive, their success in teaching creative thinking has not been outstanding, as will be noted from Table 8. Studies that have relied upon the

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creative thinking abilities of teacher have rather consistently failed to show significant results. The motivations of the teacher seem to be more powerful; the two studies using the Torrance Creative Motivation Scale for identifying high and low creative teachers (James, 1964; Torrance, 1965b) showed reasonably promising, though not really outstanding results.

Most of the studies that have focused on observation and analysis of classroom interaction have been unsuccessful. However, most of them have been doctoral studies lacking in strong commitment from the school systems involved. Where highly competent and aeasoned persons such as Soar (1968), Clark and Trowbridge (1971), Mitchell (1967; 1971) with an inservice trainer such as George I. Brown, and the like have been involved the results have been much more promising. A number of promising sidelights worth noting emerge from this category of studies. There are indications that the verbal creative thinking abilities receive useful practice in expert indirect influence teaching while the figural creative thinking abilities, especially elaboration, receive such stimulation under the expert direct teacher. The results obtained by Torrance (1969 abde) with dyadic interaction also suggest that experimentation with small group arrangements might be promising.

Motivation Studies

A number of critics of the studies reviewed in the previous section have argued that the results obtained in the studies summarized in the foregoing tables have resulted from increased motivation tather than from anything that was taught. The results summarized in Table 9 certainly suggest that motivation

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alone is powerful enough to "make a difference." Most of these results, however, have been achieved through different kinds of extrinsic motivation and generally these kinds of motivation have to be reapplied each time the desired performance is required and cannot be counted upon for continued creative thinking.

Facilitating Testing Conditions

Throughout the history of the development of tests of creative thinking ability, I think there has been a recognition that children have to be motivated to think creatively, if one is to obtain a valid measure of their creative thinking ability. Early in my own work, I experimented with extended time limits, take home tests, and variations in instructions. The elements finally packaged in 1966 as the research edition of the Torrance Tests of Creative Thinking represent a considerable compromise between what my associates and I considered reasonable and feasible for use in schools and what we considered ideal. We realize that our solution is not the best one possible and we are still considering and evaluating other alternatives. The results summarized in Table 10 indicate that improved performance on tests of creative thinking

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can probably be obtained by appropriate warm-up just prior to the administration of the test, by a game-like atmosphere, and by providing a variety of visual materials in the testing room. Take home administrations or extended time limits may produce more valid results but introduce a variety of practical problems that seem difficult to solve. Some children's lives are so completely and rigidly scheduled that they are unable to find the time to write the responses that they think of with take home tests. There are also the elements of control, copying, getting unauthorized help, losing booklets, and the like. (Many schools will not even permit children to take home their textbooks). Scoring problems are also compounded by the fact that some children produce such a large number of responses that the scoring task becomes quite time consuming.

Summary

An effort has been made to summarize the results of 133 studies designed to test approaches to teaching children to think creatively. Though most of these studies use performances on tests of creative thinking and other creative school performances as criteria, it is contended that the evidence provided by these studies provides useful guidance to educators.

The most frequently reported types of experiments are those that emphasize teacher-classroom variables, complex programs involving packages of materials, and modifications of the Osborn-Parnes training program in creative problem solving. Those having the highest percentages of success in teaching children to think creatively are those that emphasize the Osborn-Parnes training program, other disciplined approaches, the creative arts, and media-oriented programs.

In answer to the question posed in this symposium, it does indeed seem possible to teach children to think creatively. The most successful approaches seem to be those that involve both cognitive and emotional functioning, provide adequate structure and motivation, and give opportunities for involvement, practice, and interaction with teachers and other children. Motivating and facilitating conditions certainly make a difference in creative functioning but differences seem to be greatest and most predictable when deliberate teaching is involved.

TABLE 1

SUMMARY OF SUCCESSES IN TEACHING CHILDREN TO THINK CREATIVELY ACCORDING TO TYPE OF INTERVENTION

Type of Intervention	Number Studies	Number Successes	Percentage Successes
Osborn-Parnes CPS and/or modifications	22	20.0	91
Other disciplined approaches	5	4.6	92
Complex programs involving packages of materials	24	17.0	71
Creative arts as vehicle	18	14.5	81
Media and reading programs	9	7.0	78
Curricular and administrative arrangements	8	4.0	50
Teacher-Classroom variables, climate	25	14.4	58
Motivation, reward, competition	11	8.0	73
Facilitating testing conditions	11	8.0	73
TOTAL	133	97.5	73

TABLE 2

SUMMARY OF EXPERIMENTS INVOLVING OSBORN-PARNES CREATIVE PROBLEM SOLVING TRAINING AND/OR MODIFICATIONS

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Beleff (1968)	9th	Exercises in brainstorming and questioning in social studies	TTCT Fluency
Bond (1963)	4th	Osborn-Parnes training	TTCT Variables
Cartledge & Krauser (1963)	1st	Osborn principles; Torrance materials	TTCT Variables
Chung (1968)	5th	Osborn/Torrance materials	TTCT Variables High and Low IQ
Cropley & Feuring (1971)	1st	Osborn/Torrance materials	TTCT Flexibility Originality, Elab.
Eberle (1965)	JHS	Osborn-Parnes and Myers-Torrance exercises	TTCT and Guilford variables
Eberle (1967)	8th	Osborn-Parnes; Myers-Torrance	TTCT and Guilford variables
Eherts (1961)	5th	Brainstorming and exereises	TTCT Variables
Goodrich (1969)	6th	Exercises, open-structure, etc.	TTCT Originality
Hutchinson (1963, 1967)	JHS	Brainstorming and other productive thinking	4 of 10 Guilford Variables
J. C. Jones (1970)	5th 6th	Strategies of divergent thinking	TTCT all verbal figural fluency
Khatena (1969ab)	Kg.	Strategies of divergent thinking	TTCT Variables
Olkin (1967)	9th	Creative problem solving	TTCT Variables
Parnes (1966)	12th	Osborn-Parnes, programmed and instructor taught	TTCT and Guilford variables

Table 2 continued

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Perkins (1963)	5th 6th 7th	Creative Problem Solving training	TTCT variables except elabora.
Raina (1970)	HS	Creative Problem Solving training	TTCT variables
Reyburn (1963)	5th	Divergent thinking in speaking and writing	TTCT Fluency and Originality
Rouse (1963, 1965)	EMR Ages 7-17	Brainstorming and creative problem solving	TTCT variables
Rusch et al. (1967)	6th	Deliberate strategies	5 of 7 Guilford and Denny-Ives variables
Sullivan (1969) (slow learners)	9-14 yrs.	Brainstorming and creative problem solving	Verbal creative abilities
Torrance (1961)	1st-3rd	Training in idea production	TTCT in 2nd and 3rd
Yee (1964)	12th	Osborn-Parnes training	TTCT variables High and Low IQ

TABLE 3

SUMMARY OF EXPERIMENTS INVOLVING DISCIPLINED PROCEDURES

OTHER THAN OSBORN-PARNES TRAINING PROGRAM

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Allen (1969)	5th	Reading instruction involving remediation and creative dramatics.	Fluency for all treatment groups. Originality in creative dramatics plus remediation. Elaboration in all creative dramatics treatments.
Dunn (1968)	4th-8th	Techniques of survey and descriptive research	Creative research products
Schaefer	4th-5th	One hour/week on creative expression, sense perception, etc.	TTCT variables
Torrance & Myers (1962)	6th Gifted	Experiences in historical, descriptive, and experimental research	TTCT variables and research products
True (1966)	6th	General semantics training	TTCT fluency and flexibility

TABLE 4

SUMMARY OF EXPERIMENTS INVOLVING COMPLEX TRAINING PROGRAMS

WITH PACKAGES OF MATERIALS

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Bahlke (1967), Bahlke et al. (1967)	3rd 5th	Purdue Creativity Program	Figural and verbal originality; verbal fluency; figural and verbal elaboration on TTCT
Bahlke (1969), Bahlke et al. (1969)	4th 6th	Purdue Creativity Program	4th: All TTCT var. 5th: 5 of 7 TTCT 6th: 3 of 7 TTCT Exercises most eff.
Britton (1968)	6th	Myers-Torrance materials	TTCT verbal fluency flexibility and all figural variables
Casey (1968)	6th	Myers-Torrance	TTCT fluency, flexibility and originality
Covington (1967)	5th	Productive Thinking Program	Success in problem solving and reflective reading
Covington & Crutchfield (1965)	5th 6th	Productive Thinking Program	Problem solving and TTCT fluency and originality
Crutchfield (1966)	5th 6th	Productive Thinking Program	Problem solving and TTCT Fluency and originality
Davis (1971) Davis et al. (1969)	6th-8th	10-week Wisconsin course	TTCT Fluency

Table 4 continued

Investigator	Grade Level	Nature of treatment	Significant (.05) Differences
DeRoche (1965)	6th	Creativity exercises in science	TTCT variables and and science achievement
Eberle (1965, 1967)	JHS	Myers-Torrance materials	TTCT and Guilford variables
Feldhusen et al. (1969)	4th-6th	Purdue Creativity Program	TTCT verbal fluency and originality; fig. originality and elab.
Feldhusen et al. (1970)	4th-6th	Purdue Creativity Program	4th: All TTCT var. 5th: 5 of 7 TTCT 6th: 3 of 7 TTCT
Feldhusen et al. (1971); Thomas et al. (1971)	4th-6th	Purdue Creativity Program	Exercises single most effective component; presentation least
Freyermuth (1968)	Kg.	Montessori Program	TTCT variables
Olton (1969)	5th-6th	Productive Thinking Program	No gains without teacher and class involvement
Olton, Waldrop et al. (1967)	5th	Productive Thinking Program	Problems and TTCT variables; high & low IQ
Provus (1970)	3rd-8th	Chicago Inservice Training Kit	Subjective evaluations
Robinson (1969)	4th	Purdue Creativity Program	TTCT variables
Speedie et al. (1971)	4th-6th	Purdue Creative Program; 7 mos. later	4th. Exercises and stories TTCT still held; effects washed out for 5th & 6th.
Sporburg (1971)	6th	Productive Thinking Program; little class and teacher involvement	No effects on Guilford tests
Torrance (1965b)	4th-6th	Myers-Torrance exercises	No growth in creative writing

Table 4 continued

Investigator	Grade Level	Nature of Treatment	Significant Differences
Treffinger & Ripple (1969)	4th-7th	Productive Thinking Program; without class and teacher involvement	No differences on any TTCT variables
Waldrop et al. (1969)	5th	Productive Thinking Program	TTCT variables and problems; high and low IQ
Woodliffe (1970)	5th	Myers-Torrance exercises	Workbook plus inservice program, highest TTCT gains

TABLE 5

SUMMARY OF EXPERIMENTS INVOLVING THE CREATIVE ARTS AS VEHICLES FOR TEACHING CHILDREN TO THINK CREATIVELY

Investigator	Grade level	Nature of Treatment	Significant (.05) Differences
Engle (1970	HS	Creative writing	Marketable, publishable creative writing
Even (1964)	11th	Visual arts	TTCT flexibility and originality
Fortson (1969)	Kg.	Creative-Aesthetic Approach	TTCT variables Starkweather original
Frankston (1964)	8th	Visual arts	No difference in art or poetry ratings
Grossman (1969)	Kg.	Visual arts	TTCT variables
Hagander (1967)	5th	Creative writing	TTCT variables
P.M. Jones (1968) (1969)	6th	Mime, drama, visual arts, imaginative activity	TTCT variables
Karioth (1968)	4th Disad.	Creative dramatics	TTCT variables for post-test only cond.; not for pretested gps.
Madeja (1965)	HS	Visual art; convergent-divergent thinking	TTCT higher for divergent; high divergents made higher gains
Skipper (1969)	7th-10th	Living Arts Program	No gains on originality females, fluency and aesthetic sensitivity; males, sensitivity to probs.
Torrance (1965e)	1st-3rd	Creative movement	TTCT variables

Table 5 continued

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Torrance (1965b)	4th-6th	Creative writing	3 of 3 measures of creative writing
Torrance (1965b)	10th-12th	Man, Nature & the Arts Seminar (Perception)	10 of 12 TTCT var.
Torrance (1968, 1969); Torrance & Fortson (1968)	Kg.	Creative-Aesthetic Approach	TTCT variables
Torrance (1972)	Kg.	Alternate Kg. approaches, inc. Creat.-Aesthetic	Creat.-Aesthetic superior on questioning
Torrance & Torrance (1972)	1st-7th	Creativity Workshop (Summer)	TTCT variables
Vaughan & Myers (1971)	4th-5th	Music improvisation	TTCT fluency; musical creativity
Witt (1971)	2nd-4th	6-year program emphasizing music, art, drama, dance, etc.	Recognized creative achievements in one or more of the arts.

TABLE 6

SUMMARY OF EXPERIMENTS INVOLVING READING PROGRAMS AND MEDIA AS VEHICLES FOR TEACHING CHILDREN TO THINK CREATIVELY

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Casper (1964)	5th Gifted	Junior Great Books Program	Guilford operational fluency; not originality
Nash & Torrance (1970)	1st	Reading 360 Program	TTCT fluency, flexibility, originality; questioning
Thatcher (1965)	5th 6th	Basal Reading vs. Individual Reading	Ind. Read. higher on TTCT but not conclusive
Baker (1963)	5th	Films, pictures, recordings, etc. for writing	More original stories
Dallenbach & DeYoung (1969)	5th 6th	TV process series	Generally no gains on TTCT except parochial students
Karnes (1963)	4th	Typing, creative writing	Creative thinking measures and creative writing
O'Brien et al. (1964)	Nurs.	Increased number of toys	Increase in observed imaginative activities
Torrance (1964), Torrance & Gupta (1964ab), Torrance (1965)	4th	Imagi/Craft Program	TTCT variables
Torrance (1970)	1st	Manipulation of toys	Question asking

TABLE 7

SUMMARY OF EXPERIMENTS INVOLVING CURRICULAR AND ADMINISTRATIVE ARRANGEMENTS FOR TEACHING CHILDREN TO THINK CREATIVELY

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Bennett et al. (1971)	HS Gifted	Independent study	Unique projects; high subjective evaluation
Gold (1965)	4th-6th Gifted	Self-directed study	No significant gains on TTCT
Paton (1965)	4-yr. olds	Language enrichment	No significant gains on TTCT
Phillips & Torrance (1972)	1st-3rd	Cognitive-structured curriculum	Superior growth in causal thinking
Seides (1967)	7th Slow	Placement in talent class (art, music)	TTCT variables
Torrance & Phillips (1969)	1st-2nd	Cognitive-structured curriculum	1st: Fig. & Verb. Flex. 2nd: Verbal Orig. & Fig. Elab.
Torrance & Phillips (1970)	1st-3rd	Cognitive-structured plus consultants in art, music, creative writing, etc.	1st: 4 of 7 TTCT 2nd: 7 of 7 TTCT 3rd: 4 of 7 TTCT
Vreeland (1967)	Elem. JHS	Summer enrichment program	Some negative effects Generally no effect on TTCT

TABLE 8

SUMMARY OF EXPERIMENTS INVOLVING TEACHER-CLASSROOM AND CLIMATE VARIABLES IN TEACHING CHILDREN TO THINK CREATIVELY

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Broome (1967)	5th	Teacher creativity	No differences on TTCT
Castelli (1964)	3rd-6th	Teacher creativity	No differences in classroom behavior
Clark & Trowbridge (1971)	All Levels	Extensive inservice education	Increased divergent thinking in classroom (Aschner-Gallagher)
Crabtree (1967)	2nd	Jointly-determined vs. predetermined structure	In jointly-determined, more originality, flexibility, constructive play
Denny (1966)	6th	Observation, climate, structuring	No increase on Guilford tests
Enochs (1964)	5th	Teacher inservice; application of Torrance principles	TTCT originality and total
Haddon & Lytton (1968)	11-12 yr.	Informal progressive teaching in primary sch.	6 divergent thinking tests
Haddon & Lytton (1971)	Ditto	Follow up 4 yrs. later	Verbal tests held up
James (1964)	7th	High and low teachers on Torrance Creative Motivation Scale	Boys of high teachers, 4 of 8 TTCT var. Girls of high teachers 5 of 8 TTCT var.
Kaltsoumis (1969)	4th-6th Deaf	Mutual language method vs. combined method	No differences on TTCT
Mann (1966)	1st	Climate for preconscious freedom	No differences on TTCT

Table 8 continued

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Marburg (1965)	5th	Classroom climate; high and low MTAI	No differences on TTCT
Mitchell (1967, 1971)	3rd-6th	Sensitivity training (Brown)	14 of 23 subgroups showed changes on TTCT variables
Raina (1971)	8th-9th	Creative vs. noncreative school climate	TTCT variables
Rappel (1970)	2nd-5th	Direct vs. indirect influence (Flanders)	No differences on TTCT except figural flex.
Soar (1968)	3rd-6th	Degree of indirectness (Flanders)	TTCT variables related to degree of indirectness
Torrance (1965b)	1st-6th	Application of princ. (respectful of questions, ideas, etc.)	Critical incidents of creative classroom behavior
Torrance (1965b)	Kg.-6th	Inservice on rewarding creative beh.	12 of 44 TTCT in favor of Exp.
Torrance (1965b)	Kg.-6th	Torrance Creative Motivation Scale of teachers	TTCT variables for K-3; creative writing, 4-6
Torrance (1969b)	Kg.	Dyads, alone, elass	Greater willingness to try diff. in dyads
Torrance (1969ade)	Kg.	Dyads and alone	TTCT originality
Weber (1967)	4th	Indirectness of control in first 3 years and 4th.	TTCT verbal var. under indirect first 3 yrs.; TTCT figural elab. in 4th.
Wodtke (1963); Wodtke & Wallen (1965)	2nd-5th	High and low controlling teachers	Low controlling; TTCT verbal measures in 4; high controlling; TTCT elab. in 5th

TABLE 9

SUMMARY OF EXPERIMENTS INVOLVING MOTIVATION TO FACILITATE CREATIVE THINKING

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Chung (1968)	5th	Achievement-ego motiv. vs. task-reward motiv.	Task-reward raised TTET fluency and flexibility
Raina (1968)	9th	Competition, prizes	TTCT variables
Raina & Cha-Turvedi (1968)	HS	Competition, prizes	TTCT variables
Torrance (1965b)	6th	Reward for originality vs. correctness	Reward for originality resulted in more original stories
Torrance (1965b)	6th	Reward for fluency vs. originality	Reward for originality resulted in more original ideas
Torrance (1965b)	1st-6th	Competition vs. practice	TTCT flu., 1, 3, 4 TTCT flx., 2, 4 TTCT orig., 2, 3, 6
Torrance (1965b)	1st-6th	Peer critical vs. peer creative evaluation	23 of 56 differences on TTCT figural
Torrance (1965b)	kg.-6th	Unevaluated practice vs. evaluated practice	53 of 84 differences on TTCT figural
Torrance (1965b)	3rd-6th	Publication of creative writing in magazine	9 of 12 measures of creative writing
Ward, Kogan, Pankove (1970)	5th	Reward for production of ideas immediate and delayed	Fluency higher on Wallach tasks

TABLE 10

SUMMARY OF EXPERIMENTS INVOLVING FACILITATING TESTING CONDITIONS

Investigator	Grade Level	Nature of Treatment	Significant (.05) Differences
Aliotti (1969)	1st Disad.	Movement and verbal warm-up day prior to testing	Differences not significant
Boersma & O'Bryan (1968)	4th	Standard vs. relaxed	Relaxed: TTCT
Feldhusen et al. (1971)	5th 8th 11th	Standard, incubation, take home, game-like	Highest TTCT r's with ach. on Standard and lowest on game-like
Khatena (1971)	10th 12th	Variations in time limits for response	Increased time for incubation, increased originality
Kogan & Morgan (1969)	5th	Test-like and game-like (timed)	game-like, higher fluency and unique responses Wallach tests
Mohan (1970)	4th	Cue rich and cue poor testing room	TTCT variables; helped high creatives more than lows
Nash (1971)	1st Disad.	Warm-up immediately prior to testing	TTCT figural
Torrance (1969a)	6th Gifted	Take home after timed administration	Take home more valid for teacher curiosity nominations
Van Mondfrans et al. (1971)	5th 6th	Standard, incubation, take home, game-like	Standard, highest verbal means; take home, scores that fit best concept of creativity as unitary factor orthogonal to intell.

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